

ELECTRICAL AUTOMATION SYSTEMS TOWARDS INTELLIGENT AND ENERGY EFFICIENCY APPLICATIONS

Musse Mohamud Ahmed



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

ELECTRICAL AUTOMATION SYSTEMS TOWARDS INTELLIGENT AND ENERGY EFFICIENCY APPLICATIONS

Musse Mohamud Ahmed

Electrical and Computer Engineering Department,
The Faculty of Engineering, IIUM



IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
© IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

ISBN: 978-967-418-170-3

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel: +603-6188 1542 / 44 / 45 Fax: +603-6188 1543
EMAIL: iiumprinting@yahoo.com

CONTENTS OF THE BOOK

<u>Chapter</u>	<u>Title & Author</u>	<u>Page No</u>
PART I: ELECTRICAL DISTRIBUTION AUTOMATION SYSTEMS		
CHAPTER 1:	ELECTRICAL DISTRIBUTION SYSTEM Musse Mohamud Ahmed and Soo Wai Lian	2
CHAPTER 2:	ELECTRIC DISTRIBUTION EQUIPMENT FAULTS..... Musse Mohamud Ahmed and Soo Wai Lian	6
CHAPTER 3:	FAULTS FROM TRADITIONAL TO AUTOMATION TECHNIQUES..... Musse Mohamud Ahmed and Soo Wai Lian	15
CHAPTER 4:	SCADA SYSTEM FOR ELECTRICAL DISTRIBUTION SYSTEM..... Musse Mohamud Ahmed and Soo Wai Lian	22
CHAPTER 5:	SCADA SOFTWARE DEVELOPMENT–INDUSOFT CASE STUDY Musse Mohamud Ahmed and Soo Wai Lian	25
CHAPTER 6:	PROTECTION SYSTEM FOR ELECTRICAL DISTRIBUTION..... Musse Mohamud Ahmed and Soo Wai Lian	37
CHAPTER 7:	RELAYS..... Musse Mohamud Ahmed and Soo Wai Lian	43
CHAPTER 8:	REMOTE TERMINAL UNIT (RTU)..... Musse Mohamud Ahmed and Soo Wai Lian	49
CHAPTER 9:	INTELLIGENT AUTOMATION SYSTEM: AUTOMATION HARDWARE DEVELOPMENT Musse Mohamud Ahmed and Soo Wai Lian	60
CHAPTER 10:	SCHEMATIC DIAGRAMS OF AUTOMATED SUBSTATION PANELS..... Musse Mohamud Ahmed and Soo Wai Lian	69
CHAPTER 11:	SOFTWARE AUTOMATION DEVELOPMENT Musse Mohamud Ahmed and Soo Wai Lian	78
CHAPTER 12:	DEVELOPMENT OF MODBUS TCP/IP SETTING Musse Mohamud Ahmed and Soo Wai Lian	87
CHAPTER 13:	POWER LINE CARRIER COMMUNICATION SYSTEM..... Musse Mohamud Ahmed and Soo Wai Lian	96
CHAPTER 14:	WIRELESS COMMUNICATIONS FOR ELECTRIC SYSTEM AUTOMATION..... Othman O. Khalifa and Musse Mohamud Ahmed	103
CHAPTER 15:	DEVELOPMENT OF AUTOMATION SYSTEM FOR SMALL/MEDIUM	

SCALE BIOMASS BASED RENEWABLE POWER PLANTS	108
Musse Mohamud Ahmed and Sheroz Khan	

<u>Chapter</u>	<u>Title & Author</u>	<u>Page No</u>
----------------	---------------------------	----------------

PART II: INTELLIGENT SYSTEMS USING COMMUNICATION AND ELECTRONICS SYSTEMS

CHAPTER 16:	MODELING OF LOW VOLTAGE POWER LINE FOR DATA COMMUNICATION: SIMULATION RESULTS	118
	Amar Hazwani Binti Radzi, Wisatawati Darwis Harahap, Sheroz Khan, Musse Mohamud Ahmed and Khaizuran Abdullah	
CHAPTER 17:	LOW VOLTAGE POWERLINE ANALYSIS AND SIMULATION RESULTS.....	125
	Amar Hazwani Binti Radzi, Wisawati Darwis Harahap, Sheroz Khan, Musse Mohamud Ahmed and Khaizuran Abdullah.	
CHAPTER 18:	ZIGBEE APPLICATIONS TO WIRELESS COMMUNICATION SYSTEMS	133
	Hikma Shabani, Musse Mohamud Ahmed, Sheroz Khan and Rashid A. Saeed	
CHAPTER 19:	MODELING OF AN ENVIRONMENT FRIENDLY HYBRID ELECTRIC VEHICLE (HEV).....	138
	Musse Mohamud Ahmed, M. Habib Ullah, Teddy S. Gunawan, M. Raihan Sharif and Riza Muhida	
CHAPTER 20:	PIC 16F877A FOR HYBRID VEHICLE CONTROLLER	144
	Musse Mohamud Ahmed, M. Habib Ullah, Teddy S. Gunawan, M. Raihan Sharif, and Riza Muhida	
CHAPTER 21:	FPGA-BASED HARDWARE MODELING OF LIGHT RAIL TRANSIT FARE CARD CONTROLLER	155
	Musse Mohamud Ahmed, M. Raihan Sharif and M. Habib Ullah	
CHAPTER 22:	DEVELOPMENT OF A METHOD TO MAINTAIN TEMPERATURE AND HUMIDITY IN AN OPEN COMPOUND RESTAURANT	166
	M. Raihan Sharif and M. Habib Ullah, Musse Mohamud Ahmed	

PART III: ENERGY EFFICIENCY APPLICATIONS TO ELECTRIC MOTORS AND FAN MOTORS

CHAPTER 23:	ELECTRIC MOTOR	176
	Musse Mohamud Ahmed, Noor Zatil Amali Bt Muhammad Hanapi and Che Fazilah Bt Fathil	
CHAPTER 24:	LOSSES OF ELECTRIC MOTORS	180
	Musse Mohamud Ahmed, Noor Zatil Amali Bt Muhammad Hanapi and Che Fazilah Bt Fathil	
CHAPTER 25:	ELECTRIC MOTOR EFFICIENCY	185
	Musse Mohamud Ahmed, Noor Zatil Amali Bt Muhammad Hanapi	

and Che Fazilah Bt Fathil

CHAPTER 26:	ENERGY EFFICIENCY IMPLEMENTATION OF PERMANENT MAGNET SYNCHRONOUS MOTOR.....	191
	Musse Mohamud Ahmed, Noor Zatil Amali Bt Muhammad Hanapi and Che Fazilah Bt Fathil	

<u>Chapter</u>	<u>Title & Author</u>	<u>Page No</u>
CHAPTER 27:	ENERGY CALCULATIONS.....	195
	Musse Mohamud Ahmed, Noor Zatil Amali Bt Muhammad Hanapi and Che Fazilah Bt Fathil	
CHAPTER 28:	MODELING, RESULT AND ANALYSIS	203
	Musse Mohamud Ahmed, Noor Zatil Amali Bt Muhammad Hanapi and Che Fazilah Bt Fathil	
CHAPTER 29:	AIR BLOWING EQUIPMENT	210
	Musse Mohamud Ahmed, Rafizah Rahmatullah and Syarifah Nur Zati Abdul Rashid	
CHAPTER 30:	ENERGY USAGE IN MALAYSIA.....	214
	Musse Mohamud Ahmed, Rafizah Rahmatullah and Syarifah Nur Zati Abdul Rashid	
CHAPTER 31:	FAN MOTOR EFFICIENCY REQUIREMENT.....	217
	Musse Mohamud Ahmed, Rafizah Rahmatullah and Syarifah Nur Zati Abdul Rashid	
CHAPTER 32:	APPLICATION OF FAN MOTOR ENEGY EFFICIENCY.....	220
	Musse Mohamud Ahmed, Rafizah Rahmatullah and Syarifah Nur Zati Abdul Rashid	
CHAPTER 33:	FAN EFFICIENCY GRADE (FEG) DEVELOPMENT STAGES.....	223
	Musse Mohamud Ahmed, Rafizah Rahmatullah and Syarifah Nur Zati Abdul Rashid	
CHAPTER 34:	FEG AND FMEG PRACTICAL CONSIDERATIONS – FAN SELECTIONS GUIDE	227
	Musse Mohamud Ahmed, Rafizah Rahmatullah and Syarifah Nur Zati Abdul Rashid	
CHAPTER 35:	RESULTS AND DISCUSSIONS.....	232
	Musse Mohamud Ahmed, Rafizah Rahmatullah and Syarifah Nur Zati Abdul Rashid	

CHAPTER 30

ENERGY USAGE IN MALAYSIA

Musse Mohamud Ahmed, Rafizah Rahmatullah and Syarifah Nur Zati Abdul Rashid

*Department of Electrical and Computer Engineering, Faculty of Engineering
International Islamic University Malaysia*

30.1 Introduction

In this chapter, some analysis of energy supply against its prices in Malaysia scenario will be presented and analyzed. Recent and current development on energy efficiency ground work will be discussed and why we need to consider energy efficiency will also be taken into considerations.

The new Malaysia power report forecasts that the country will account for 1.34 percent of Asia Pacific regional power generation by 2014, with a broadly balanced domestic market. The estimation for 2009 suggests Asia Pacific regional generation of 7,324 terawatt hours (TWh). Thus, an increase in regional generation to 9,730TWh by 2014 should be forecasted, which represents a rise of 32.85 percent in 2009-2014[1]. From the Fig 30.1, it shows that the trend of energy supply per capita increased years by years.

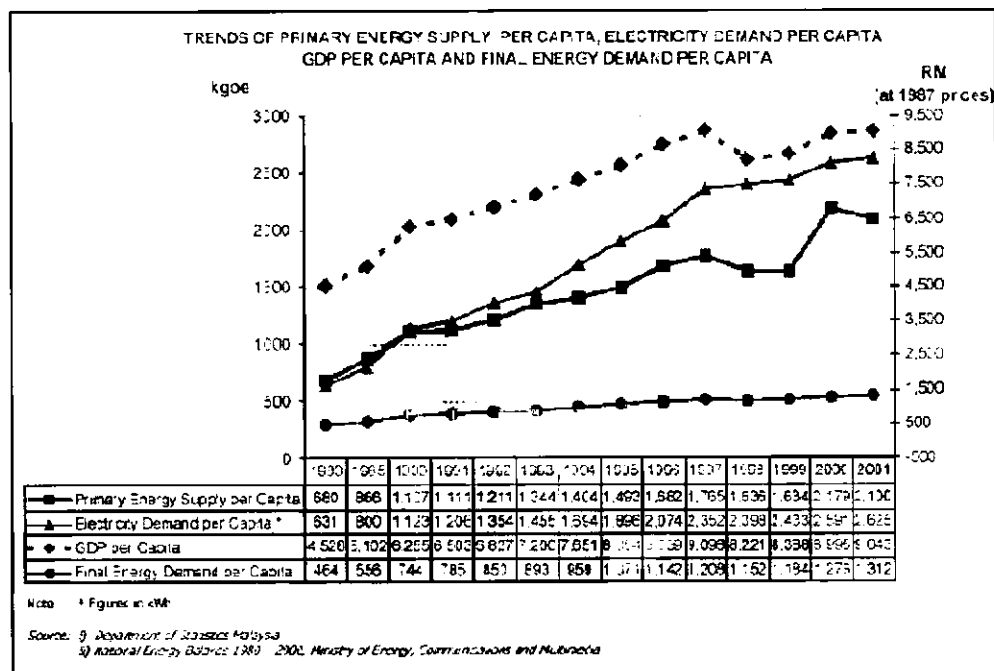


Figure 30.1: Energy Supply Per Capita from 1990 – 2001 in Malaysia